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3He experiments: Insights into cosmology and atomic physics

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Abstract

Superfluid 3He, since its discovery by Osheroff, Richardson and Lee in 1972, has become one of the main systems for experimental studies of quantum field theories. This is due to the very rich order parameter of the quantum state for the triplet Cooper pairing of superfluid 3He, which exhibits, in addition to superfluid properties, properties of a magnetically-ordered quantum liquid crystal! The superfluid state, particularly at very low temperatures, is a quantum vacuum with a complicated order parameter, which carries various types of quasiparticles and topological defects. It can be considered a test system for the experimental investigations of many general physical problems in cosmology, atomic and nuclear physics, which are otherwise difficult or even impossible to investigate experimentally. © 2009 Springer Science+Business Media, LLC.

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